

REMARKS/ARGUMENTS

Favorable reconsideration of this Application, as presently amended and in light of the following discussion, is respectfully requested.

This Amendment is in response to the Office Action mailed on March 10, 2004. Claims 1-190 are pending and stand rejected in this Application. Claims 1, 2, 4, 6, 11, 13, 17, 18, 25, 26, 33, 34, 41, 42, 49, 50, 57, 58, 65, 66, 68, 70, 71, 76, 78, 79, 83-86, 90, 91, 95-98, 102, 103, 107-110, 114, 115, 119-122, 126, 127, 131-134, 138, 139, 143-146, 150, 151, 155-158, 162, 163, 167-170, 174, 175, 179-182, 186, and 187 are amended by the present Amendment.

Claims 1-190 stand rejected under 35 U.S.C. §112, second paragraph as being indefinite because of several terms used therein. Applicants respectfully disagree with the position taken in the outstanding Office Action. Applicants will address separately each aspect of this rejection below.

As to the use of the term “stereoscopic lattice,” Applicants respectfully disagree with the interpretation provided for it in the outstanding Office Action. It is asserted that stereoscopic requires two cameras. First, as clearly disclosed, only one camera is needed. Secondly, “stereoscopy is the science that deals with stereoscopic effects and methods[, that is,] the seeing of objects in three dimensions.”<sup>1</sup> In addition, as further discussed below, a Moiré stereoscopic lattice type device was clearly explained by Applicants.<sup>2</sup> Applicants respectfully submit that the term “stereoscopic lattice” does not render the claims in this Application indefinite and respectfully request that the rejection of Claims 1-190 be withdrawn.

In reference to Claims 6, 13, and 65, Applicants respectfully submit that the expression “measurement range” does not render these claims indefinite. The term has been

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<sup>1</sup> See, for example, Merriam Webster Dictionary, online.

<sup>2</sup> See, for example, specification, page 2, line 23 – page 3, line 21.

explained in the specification and illustrated on at least FIGS. 8 and 10 of Applicants' specification. It refers to a region in the work piece picked up by the camera limited to several fringe orders as recited in most independent claims.<sup>3</sup> Applicants respectfully submit that the term "measurement range" does not render Claims 6, 13, and 65 in this Application indefinite and respectfully request that the rejection thereof be withdrawn.

As to the term "stepped lattice pattern..." in Claims 25, 41, 57, 95, 119, and 143, Applicants respectfully submit that such a term does not render those claims indefinite. In fact, the meaning of this term is clearly illustrated in FIG. 20 of Applicants' Application and explained on the disclosure of that figure.<sup>4</sup> Applicants respectfully request that the rejection of Claims 25, 41, 57, 95, 119, and 143 be withdrawn.

In reference to Claims 67-69 and 75-77 under 35 U.S.C. §112, second paragraph, Applicant respectfully submit that the meaning of the term "a distance shifting mechanism" is self evident from the claim language. It is a mechanism "for varying the distance between the light source and the light-sensitive device."<sup>5</sup> Based at least on this reason, Applicants respectfully submit that the term "a distance shifting mechanism" does not render Claims 67-69 and 75-77 in this Application indefinite and respectfully request that the rejection thereof under 35 U.S.C. §112 be withdrawn.

Lastly, in reference to Claims 71, 79, 86, 91, 98, 103, 110, 115, 122, 127, 134, 139, 146, 151, 158, 163, 170, 175, 182, and 187, the recited feature of the work being flat does not render to claim language indefinite in view of what has been disclosed.<sup>6</sup> Based at least on this reason, Applicants respectfully submit that the recited feature of the work being flat does not render the listed claims indefinite. Applicants respectfully request that the rejection of

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<sup>3</sup> See, for example, specification, page 19, line 4-13, and page 23, lines 1-18.

<sup>4</sup> See, for example, the discussion of the sixth embodiment, starting on page 33, line 7 of the specification.

<sup>5</sup> See, for example, Claim 67 and Claim 75.

<sup>6</sup> See, for example, the discussion of FIG. 19 of this Application on the specification, page 32, starting on line 1.

Claims 71, 79, 86, 91, 98, 103, 110, 115, 122, 127, 134, 139, 146, 151, 158, 163, 170, 175, 182, and 187 under 35 U.S.C. § 112 be withdrawn.

Claims 1-5, 7-12, 14-64, 66, 70, 72-74, 78, 80-85, 87-90, 92-97, 99-102, 104-109, 111-114, 116-121, 123-126, 128-133, 135-138, 140-145, 147-150, 152-157, 159-162, 164-169, 171-174, 176-181, 183-186, and 188-190 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Shirley (U.S. Patent No. 6,609,474, hereinafter "Shirley").

Applicants respectfully submit that Shirley does not support a *prima facie* case of obviousness of the invention recited in the independent Claims 1, 17, 25, 33, 41, 49, 57, 65, 83, 95, 107, 119, 131, 143, 155, 167, and 179. This is so because, even when combined, this prior art reference does not teach or suggest all the claim features recited therein. One should note that, although Claim 65 was not formally rejected in view of Shirley, in the interest of compact prosecution, Applicants submit herein arguments in support of its patentability in view of Shirley.

Shirley describes an apparatus and methods of measuring three-dimensional position information of a point on the surface of an object. As clearly disclosed in Shirley's abstract, two sources of radiation, or light sources, having a spectral distribution, are used. See, for example, elements P1 and P2 in all of the figures of Shirley.

Applicants respectfully submit that at least for the reason that Shirley requires two light sources having a spectral distribution, that reference does not render obvious the invention in Claims 1, 17, 25, 33, 41, 49, 57, 65, 83, 95, 107, 119, 131, 143, 155, 167, and 179. These claims recite the feature of a light source. In other words, a single light source is used and not two light sources. It is clear from the disclosure of Shirley that two light sources are needed for the apparatus and method disclosed.<sup>7</sup> The outstanding Office Action is silent as to any explanation on the difference on the number of light sources used or in any

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<sup>7</sup> See, for example, Shirley, Col. 7, lines 21-44.

motivation based on a sound technical reason to remove one light source from Shirley.

Based at least on this fact, Applicants respectfully submit that Shirley does not render obvious the invention recited in Claims 1, 17, 25, 33, 41, 49, 57, 65, 83, 95, 107, 119, 131, 143, 155, 167, and 179.

In addition, the outstanding Office Action is silent on how Shirley discloses or teaches the following features recited in the following claims:

(i) Claim 1 - moiré fringes of a particular fringe order are shifted by a preselected phase while a measurement range of the testing optics is limited to a vicinity of the particular fringe order;

(ii) Claim 17 - at least three lines of moiré image data shifted in phase are generated by a one-line scanning time of the light-sensitive device and a reciprocal movement of the lattice pattern synchronous to each other;

(iii) Claim 25 - a moving mechanism that moves a stepped lattice pattern back and forth to thereby position the lattice surfaces on the optical axis one by one, thereby shifting moiré fringes of a particular fringe order by a preselected phase, and at least three lines of moiré image data shifted in phase are generated by a one-line scanning time of the light-sensitive device and a reciprocal movement of the stepped lattice pattern synchronous to each other;

(iv) Claim 33 - a moving mechanism that moves a lattice pattern back and forth to thereby shift fringe patterns of a particular fringe order by a preselected phase, and three moiré image data of different colors shifted in phase are generated by a one-line or one-frame scanning time of the color sensor camera and an operation of the switching mechanism synchronous to each other;

(v) Claim 41 - a stepped lattice pattern for producing moiré fringes, the stepped lattice pattern having three stepped lattice surfaces different in height in a direction of an optical

axis, a moving mechanism for moving the stepped lattice pattern back and forth in a direction perpendicular to a direction of the optical axis of a line sensor camera, the moving mechanism moves the lattice pattern back and forth to thereby sequentially position lattice patterns of the lattice surfaces on the optical axis one by one, thereby shifting fringe patterns of a particular fringe order by a preselected phase, and three moiré image data of different colors shifted in phase are generated by a one-line or one-frame scanning time of the color sensor camera and an operation of the switching mechanism synchronous to each other;

(vi) Claim 49 - a lattice pitch of a lattice pattern is varied to thereby shift moiré fringes of a particular fringe order by a preselected phase, and at least three lines of moiré image data shifted in phase are generated by a one-line scanning time of the light-sensitive device and variation of the lattice pitch of the lattice pattern synchronous to each other;

(vii) Claim 57 - a stepped lattice pattern for producing moiré fringes, the stepped lattice pattern having at least three lattice surfaces different in height in a direction of an optical axis, the pixels on each line pick up a moiré image via a particular one of the lattice surfaces for thereby shifting fringe patterns of a particular fringe order by a preselected phase, and at least three lines of moiré image data shifted in phase are generated by scanning times of the pixels on the lines synchronous to each other;

(viii) Claim 83 - a lattice pattern for producing moiré fringes, a moving mechanism for moving the lattice pattern back and forth in a direction of an optical axis of the light-sensitive device for thereby shifting moiré fringes of a particular order by a preselected phase, synchronizing means for synchronizing a one-line scanning time of the light-sensitive device and a reciprocal movement of the lattice pattern, and data processing means for executing an arithmetic operation with at least three lines of moiré image data shifted in phase, which are produced by the one-line scanning time of the light-sensitive device and a reciprocal movement of said lattice pattern synchronous to each other;

(ix) Claim 95 - a lattice pattern comprising a stepped lattice pattern having at least three lattice surfaces, which are different in height in a direction of an optical axis, for shifting moiré fringes of a particular fringe order by a preselected phase, the surface configuration measuring apparatus comprising: a moving mechanism for moving the stepped lattice pattern back and forth in a direction perpendicular to a direction of the optical axis of the light-sensitive device for thereby sequentially positioning the lattice surfaces on the optical axis, synchronizing means for synchronizing a one-line scanning time of the light-sensitive device and a reciprocal movement of the stepped lattice pattern, and data processing means for executing an arithmetic operation with at least three lines of moiré image data shifted in phase, which are produced by the one-line scanning time of the light-sensitive device and a reciprocal movement of the stepped lattice pattern synchronous to each other.

(x) Claim 107 - a lattice pattern for producing moiré fringes on a configuration measuring apparatus comprising: a moving mechanism for moving the lattice pattern back and forth in a direction of an optical axis of the color sensor camera for thereby shifting moiré fringes of a particular fringe order by a preselected phase, filters of different colors positioned between the work piece and the color sensor camera, a switching mechanism for selectively positioning the color filters on the optical axis of the color sensor camera, synchronizing means for synchronizing a one-line or one-frame scanning time of the color sensor camera, a reciprocal movement of the lattice pattern and an operation of the switching mechanism, and data processing means for executing an arithmetic operation with at three colors of moiré image data shifted in phase, which are generated by the one-line or one-frame scanning time of the color sensor camera, the reciprocal movement of the lattice pattern and the operation of the switching mechanism.

(xi) Claim 119 - a stepped lattice pattern having at least three lattice surfaces, which are different in height in a direction of an optical axis, for shifting moiré fringes of a

particular fringe order by a preselected phase, on a surface configuration measuring apparatus comprising: a moving mechanism for moving the stepped lattice pattern back and forth in a direction of the optical axis of the color sensor camera for thereby sequentially positioning lattice patterns of the lattice surfaces on the optical axis, color filters of different colors positioned between the work piece and the color sensor camera, a switching mechanism for selectively positioning the color filters on the optical axis of the color sensor camera, synchronizing means for synchronizing a one-line or one-frame scanning time of the color sensor camera, a reciprocal movement of the stepped lattice pattern and an operation of the switching mechanism, and data processing means for executing an arithmetic operation with three colors of moiré image data shifted in phase, which are produced by the one-line or one-frame scanning time of the color sensor camera, the reciprocal movement of said stepped pattern and the operation of the switching mechanism synchronous to each other.

(xii) Claim 131 - a lattice pattern with a variable lattice pitch for producing moiré fringes, and a light-sensitive device including a lens and a camera for picking up said moiré fringes on a surface configuration measuring apparatus comprising: synchronizing means for synchronizing a one-line scanning time of the light-sensitive device and a lattice pitch varying operation of the lattice pattern, and data processing means for executing an arithmetic operation with at least three lines of moiré image data shifted in phase, which are generated by the one-line scanning time of said light-sensitive device and the lattice pitch varying operation synchronous to each other, for thereby measuring a surface configuration of the work piece;

(xiii) Claim 143 - a stepped lattice pattern having at least three lattice surfaces different in height in a direction of an optical axis for shifting fringes of a particular fringe order by a preselected phase a surface configuration measuring apparatus comprising: a mechanism for shifting a relative position between the moiré optics and a surface of the work

piece, synchronizing means for synchronizing scanning times of the three lines of pixels of the camera, and data processing means for executing an arithmetic operation with at least three lines of moiré image data shifted in phase, which are generated by an operation of the mechanism and the scanning times of the three lines of pixels synchronous to each other.

(xiv) Claim 155 - a camera comprising at least three parallel lines of pixels, a surface of a work piece being parallel to and spaced by a same distance from the at least three parallel lines of pixels at a side opposite to the camera, a lattice pattern being not inclined in a direction in which the pixels are arranged, but being inclined in a direction in which the lines are arranged, such that each line of pixels is spaced by a particular distance from the lattice pattern to thereby pick up the surface of the work piece in a form of a particular moiré image shifted by a preselected phase, the surface configuration measuring apparatus comprising: a mechanism for moving a relative position between the moiré optics and the surface of the work piece in a direction in which the lattice pattern is inclined, synchronizing means for synchronizing scanning times of the at least three lines of pixels, and data processing means for executing an arithmetic operation with at least three lines of moiré image data shifted in phase, which are generated by an operation of the mechanism and the scanning times of the three lines of pixels synchronous to each other.

(xv) Claim 167 - a camera comprising at least three parallel lines of pixels that are parallel to a lattice pattern, a surface of a work piece, which faces the camera with the intermediary of the lattice pattern, being parallel to and spaced by a same distance from the lattice pattern, the at least three lines of pixels each picking up a particular portion of the surface of said work piece as a visual field, the lattice pattern having different pitches each being assigned to a particular visual field such that each line of pixels output a moiré image shifted by a preselected phase on a surface configuration measuring apparatus comprising: a mechanism for moving a relative position between the moiré optics and the surface of the



work piece in a direction in which the at least three lines of the camera are arranged;  
synchronizing means for synchronizing scanning times of the at least three lines of pixels,  
and data processing means for executing an arithmetic operation with at least three lines of  
moiré image data shifted in phase, which are generated by an operation of said mechanism  
and the scanning times of the three lines of pixels synchronous to each other.

(xvi) Claim 179 - a surface configuration measuring apparatus using a camera  
comprising at least three parallel lines of pixels that are parallel to a lattice pattern, a surface  
of a work piece being not inclined in a direction in which the pixels are arranged, but being  
inclined in a direction in which the lines are arranged, such that each line of pixels picks up a  
particular portion of the surface of the work piece spaced by a particular distance from the  
lattice pattern as a visual field to thereby pick up the portion in a form of a particular moiré  
image shifted by a preselected phase, the surface configuration measuring apparatus  
comprising: a mechanism for moving a relative position between the moiré optics and the  
surface of the work piece in a direction in which the surface is inclined, synchronizing means  
for synchronizing scanning times of the at least three lines of pixels, and data processing  
means for executing an arithmetic operation with at least three lines of moiré image data  
shifted in phase, which are generated by an operation of the mechanism and the scanning  
times of said three lines of pixels synchronous to each other; and

(xvii) Claim 65 - a phase shifting mechanism for shifting moiré fringes of a particular  
fringe order by a preselected phase, the camera having a measurement range limited to a  
vicinity of the particular fringe order, and data processing means for executing an arithmetic  
operation with at least three moiré image data shifted in phase by the phase shifting  
mechanism and output from the camera.

One is respectfully remind that, as required by MPEP §2143 through §2143.03, in  
establishing a *prima facie* case of obviousness the initial burden is placed on the Examiner.

“To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.”<sup>8</sup>

Based at least on the foregoing reasons, Applicants respectfully submit that Shirley does not make obvious the invention recited in the independent Claims 1, 17, 25, 33, 41, 49, 57, 65, 83, 95, 107, 119, 131, 143, 155, 167, and 179. Furthermore, all claims depending from these independent claims are allowable, among other reasons, as depending directly or indirectly therefrom. For the foregoing remarks, Applicants respectfully request that the Examiner withdraw the rejection of Claims 1-5, 7-12, 14-66, 70, 72-74, 78, 80-85, 87-90, 92-97, 99-102, 104-109, 111-114, 116-121, 123-126, 128-133, 135-138, 140-145, 147-150, 152-157, 159-162, 164-169, 171-174, 176-181, 183-186, and 188-190 under 35 U.S.C. § 103(a).

Finally, although the expressions “tridimensional”<sup>9</sup> and “work” have been properly used, in view of the suggestion by the Examiner, “tridimensional” and “work” have been replaced in the claims by “three dimensional” and “work piece” as suggested. Applicants respectfully submit that no new matter has been introduced by virtue of these amendments.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal Allowance. A Notice of Allowance for Claims 1-190 is earnestly solicited.

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<sup>8</sup> See, for example, MPEP §§706.02(j) and 2142, citing *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

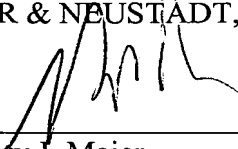
<sup>9</sup> See, for example, the definition of tridimensional in the Merriam Webster dictionary online, i.e., “of, relating to, or concerned with three dimensions.”

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Reply to Office Action of March 10, 2004

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact Applicants' undersigned representatives at the below listed telephone number.

Respectfully submitted,

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